FLIGHT SUMMARY REPORT

Flight Number: 99-140

Calendar/Julian Date: 30 September 1999 • 273

Sensor Package: Wild Heerbrugg RC-10 (12" and 6")
Airborne Visible and Infrared Imaging Spectrometer (AVIRIS)
Thematic Mapper Simulator (TMS)

Area(s) Covered: Colorado

Investigator(s): Goetz, U. of CO; Keller, U. of TX; Rowan, USGS

Aircraft #: 806

SENSOR DATA

Accession #:	05406	05407	-----	-----
Sensor ID #:	034	035	099	074
Sensor Type:	RC-10	RC-10	AVIRIS	TMS
Focal Length:	12" 304.66 mm	6" 153.46 mm	-----	-----
Film Type:	Aerochrome IR SO-060	Aerochrome IR SO-134	-----	-----
Filtration:	Wratten 12	Wratten 12 + 2.2 AV	-----	-----
Spectral Band:	510-900nm	510-900 nm	-----	-----
f Stop:	11	8	-----	-----
Shutter Speed:	1/275	1/275	-----	-----
# of Frames:	5	76	-----	-----
% Overlap:	60	60	-----	-----
Quality:	Fair	Good	-----	Good
Remarks:	Add 10 seconds for correct UTC	Data block unreadable		

Airborne Science Program

The Airborne Science Program at NASA's Dryden Flight Research Center, Edwards, California, operates two ER-2 high altitude aircraft in support of NASA earth science research. The ER-2s are used as readily deployable high altitude sensor platforms to collect remote sensing and in situ data on earth resources, celestial phenomena, atmospheric dynamics, and oceanic processes. Additionally, these aircraft are used for electronic sensor research and development and satellite investigative support.

The ER-2s are flown from various deployment sites in support of scientific research sponsored by NASA and other federal, state, university, and industry investigators. Data are collected from deployment sites in Kansas, Texas, Virginia, Florida, and Alaska. Cooperative international scientific projects have deployed the aircraft to sites in Great Britain, Australia, Chile, and Norway.

Photographic and digital imaging sensors are flown aboard the ER-2s in support of research objectives defined by the sponsoring investigators. High resolution mapping cameras and digital multispectral imaging sensors are utilized in a variety of configurations in the ER-2s' four pressurized experiment compartments. The following provides a description of the digital multispectral sensor(s) and camera(s) used for data collection during this flight.

Airborne Visible and Infrared Imaging Spectrometer

The Airborne Visible and Infrared Imaging Spectrometer (AVIRIS) is the second in the series of imaging spectrometer instruments developed at the Jet Propulsion Laboratory (JPL) for earth remote sensing. This instrument uses scanning optics and four spectrometers to image a 614-pixel swath simultaneously in 224 contiguous spectral bands (0.4-2.4 mm).

AVIRIS parameters are as follows:

IFOV:	1 mrad
Ground Resolution:	66 feet (20 meters) at 65,000 feet
Total Scan Angle:	30^{o}
Swath Width:	5.7 nmi (10.6 km) at 65,000 feet
Spectral Coverage:	0.41-2.45 _m
Pixels/Scan Line:	614
Number of Spectral Bands:	224
Digitization:	10-bits
Data Rate:	17 MBPS

Spectrometer	Wavelength Range	Number of Bands	Sampling Interval
1	0.41 - 0.70 _m	31	9.4 nm
2	0.68 - 1.27 _m	63	9.4 nm
3	1.25 - 1.86 _m	63	9.7 nm
4	1.84 - 2.45 _m	63	9.7 nm

All AVIRIS data is decommutated and archived at JPL and not currently available for public distribution. For further information contact Rob Green at Jet Propulsion Laboratory, 4800 Oak Grove Drive, Mail Stop 183-501, Pasadena, California 91109-8099.

Camera Systems

Various camera systems and films are used for photographic data collection. Film types include high definition color infrared, natural color, and black and white emulsions. Available photographic systems are as follows:

- Wild-Heerbrugg RC-10 metric mapping camera
  - 9 x 9 inch film format
  - 6 inch focal length lens provides area coverage of 16 x 16 nautical miles from 65,000 feet
  - 12 inch focal length lens provides area coverage of 8 x 8 nautical miles from 65,000 feet

- Hycon HR-732 large scale mapping camera
  - 9 x 18 inch film format
  - 24 inch focal length lens provides area coverage of 4 x 8 nautical miles from 65,000 feet

- IRIS II Panoramic camera
  - 4.5 x 34.7 inch film format
  - 24 inch focal length lens
  - 90 degree field of view provides area coverage of 2 x 21.4 nautical miles from 65,000 feet

Thematic Mapper Simulator

The Daedalus Thematic Mapper Simulator (TMS) is a multispectral scanner flown aboard the ER-2 aircraft which simulates spatial and spectral characteristics of the seven Landsat-D Thematic Mapper bands. The specific bands are as follows:

Daedalus Channel	TM Band	Wavelength, μm
1	A	0.42 - 0.45
2	1	0.45 - 0.52
3	2	0.52 - 0.60
4	B	0.60 - 0.62
5	3	0.63 - 0.69
6	C	0.69 - 0.75
7	4	0.76 - 0.90
8	D	0.91 - 1.05
9	5	1.55 - 1.75
10	7	2.08 - 2.35
11	6	8.5 - 14.0 low gain
12	6	8.5 - 14.0 high gain

Sensor/aircraft parameters are as follows:

IFOV:	1.25 mrad
Ground Resolution:	81 feet (25 meters) at 65,000 feet
Total Scan Angle:	43^{o}
Swath Width:	8.4 nmi (15.6 km) at 65,000 feet
Pixels/Scan Line:	716
Scan Rate:	12.5 scans/second
Ground Speed:	400 kts (206 m/second)

Data Availability

The U.S. Geological Survey's EROS Data Center at Sioux Falls, South Dakota serves as the archive and product distribution facility for Airborne Science Program aircraft acquired photographic and digital imagery. The photographic archive consists of photography acquired by the program from 1971 to April 1996. For information regarding photography and digital data (including areas of coverage, products, and product costs) contact EROS Data Center, Customer Services, Sioux Falls, South Dakota 57198 (Telephone: 605.594.6151).

As of April 1996 the EROS Data Center no longer receives an archive copy of newly acquired Airborne Science Program photography. Original photography is archived with the Airborne Sensor Facility at Ames Research Center. A user copy of the photography is provided to the principal investigators for each flight. Principal investigators are cited on the first page of their respective flight summary reports. For information regarding photography acquired from April 1996 to the present contact the Airborne Sensor Facility as follows:

Flight Documentation and Data Archive Searches

The following is the web site for flight documentation as published by the Airborne Sensor Facility at NASA Ames Research Center: http://asapdata.arc.nasa.gov/er-2fsr.html

Additional information regarding flight documentation to include data archive searches, data availability, sensor parameters, and areas of coverage may be obtained from the following:
Airborne Sensor Facility, MS 240-6, NASA Ames Research Center, Moffett Field, CA 94035-1000, Telephone: 650.604.6252 (FAX 650.604.4987).

CAMERA FLIGHT LINE DATA
FLIGHT NO. 99-140

Accession # 05406

Sensor # 034

Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
V - W	3535-3539	19:02:51	19:04:39	65400/19934	Clear; double exposure and emulsion damage (frame 3535)

CAMERA FLIGHT LINE DATA
FLIGHT NO. 99-140

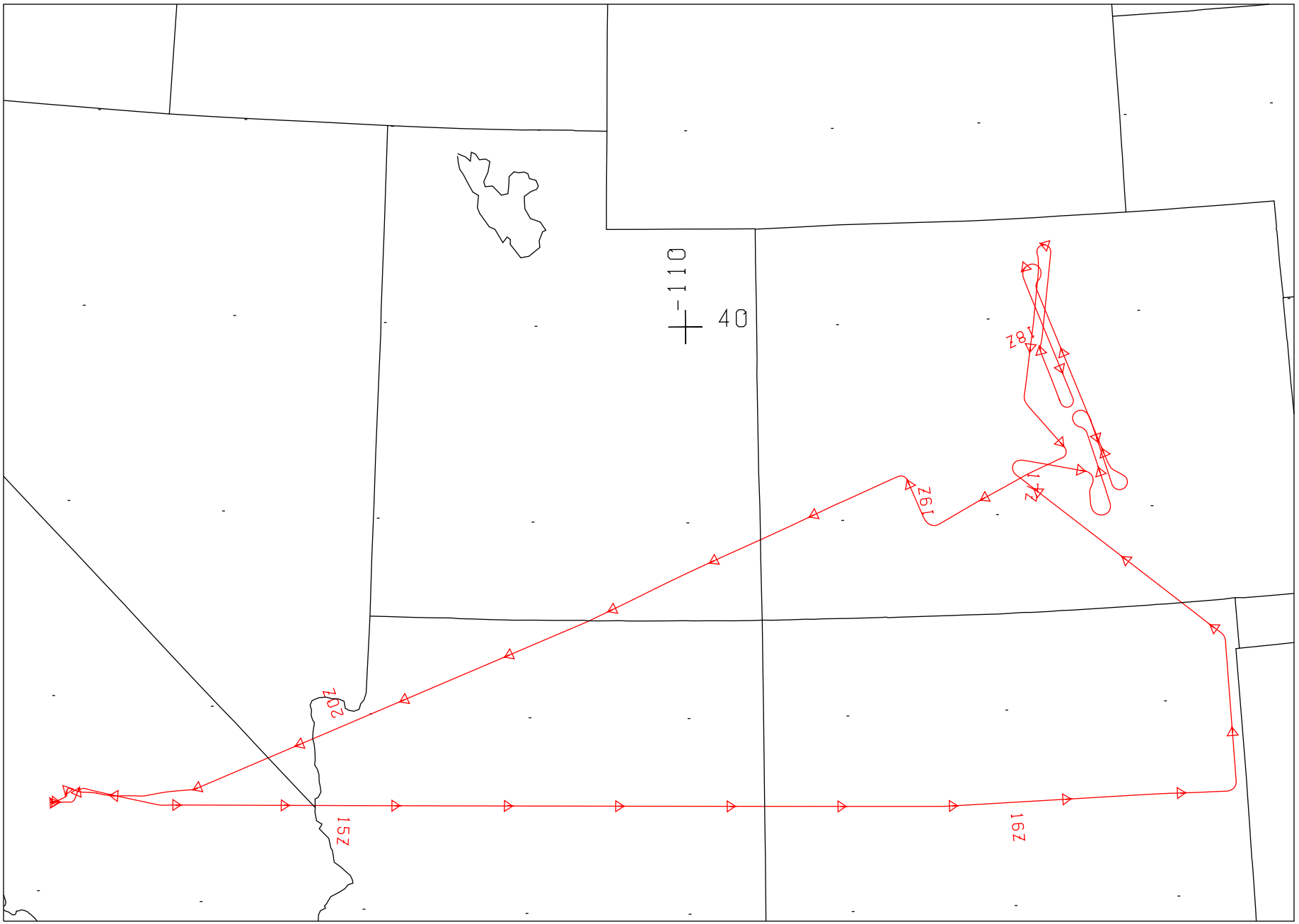
Accession # 05407

Sensor # 035

Check Points	Frame Numbers	Time (GMT-hr, min, sec) START	Time (GMT-hr, min, sec) END	Altitude, MSL feet/meters	Cloud Cover/Remarks
C - D	9999-0013	16:20:30	16:33:09	65000/19812	Clear
E - F	0014-0020	17:00:00	17:04:55	65000/19812	Clear
G - H	0021-0028	17:12:20	17:18:13	66000/20117	Clear
I - J	0029-0035	17:24:00	17:28:55	66000/20117	Clear
I - L	0036-0049	17:39:00	17:50:41	66000/20117	Clear
M - N	0050-0062	17:57:00	18:07:43	64000/19507	Clear
P - Q	0063-0070	18:17:00	18:22:53	66000/20117	10-30% cirrus (frames 0066-0068)
S - T	0071-0074	18:41:00	18:43:01	66000/20117	Clear

DAEDALUS FLIGHT DATA
FLIGHT NUMBER: 99-140

Check Points	Actual time (GMT) begin	end	Actual scanline begin	end	Altitude feet/meter	ground speed knots/mps	Scan Speed (rps)	total Good scanlines	total Interpolated scanlines	total Repeated scanlines
A-B	15:23:26.0	15:53:48.0	48205	70985	65172/19864	420/211	12.50	22001	0	780
B-C	15:54:32.0	16:18:58.0	71535	89855	65450/19949	430/216	12.50	18051	0	270
C-D	16:20:50.0	16:33:10.0	91265	100515	64613/19694	417/209	12.50	9221	0	30
D-E	16:35:29.0	16:57:05.0	102245	118445	65534/19975	423/212	12.50	16201	0	0
E-F	16:59:41.0	17:05:15.0	120395	124565	64220/19574	403/202	12.50	4141	0	30
G-H	17:12:07.0	17:18:27.0	129725	134465	65340/19916	413/207	12.50	4711	0	30
I-J	17:23:22.0	17:29:09.0	138155	142495	66150/20163	422/212	12.50	4311	0	30
K-L	17:34:24.0	17:50:59.0	146435	158875	66529/20278	409/205	12.50	12381	0	60
M-N	17:56:05.0	18:07:34.0	162695	171305	64490/19657	406/204	12.50	8581	0	30
O-P	18:10:03.0	18:14:26.0	173175	176455	65537/19976	418/210	12.50	3251	0	30
P-Q	18:16:11.0	18:23:39.0	177765	183365	65879/20080	415/208	12.50	5511	0	90
L-R	18:28:07.0	18:32:01.0	186715	189645	65209/19876	409/205	12.50	2899	0	32
R-S	18:32:25.0	18:39:06.0	189945	194955	65306/19905	410/206	12.50	4949	0	62
S-T	18:40:42.0	18:45:06.0	196155	199455	65416/19939	422/212	12.50	3301	0	0
T-E	18:46:42.0	18:49:38.0	200655	202855	65244/19886	400/201	12.50	2201	0	0
E-U	18:50:22.0	18:55:10.0	203405	207005	65458/19952	401/201	12.50	3601	0	0
U-V	18:55:34.0	18:59:30.0	207305	210255	65507/19967	403/202	12.50	2951	0	0
V-W	19:01:46.0	19:04:58.0	211955	214355	65345/19917	418/210	12.50	2371	0	30
W-X	19:06:36.0	19:11:59.0	215585	219615	65079/19836	415/208	12.50	3999	0	32
X-Y	19:12:31.0	19:36:43.0	220015	238165	65663/20014	420/211	12.50	18151	0	0
Y-Z	19:37:19.0	20:11:15.0	238615	264064	64723/19728	429/215	12.50	25420	0	30



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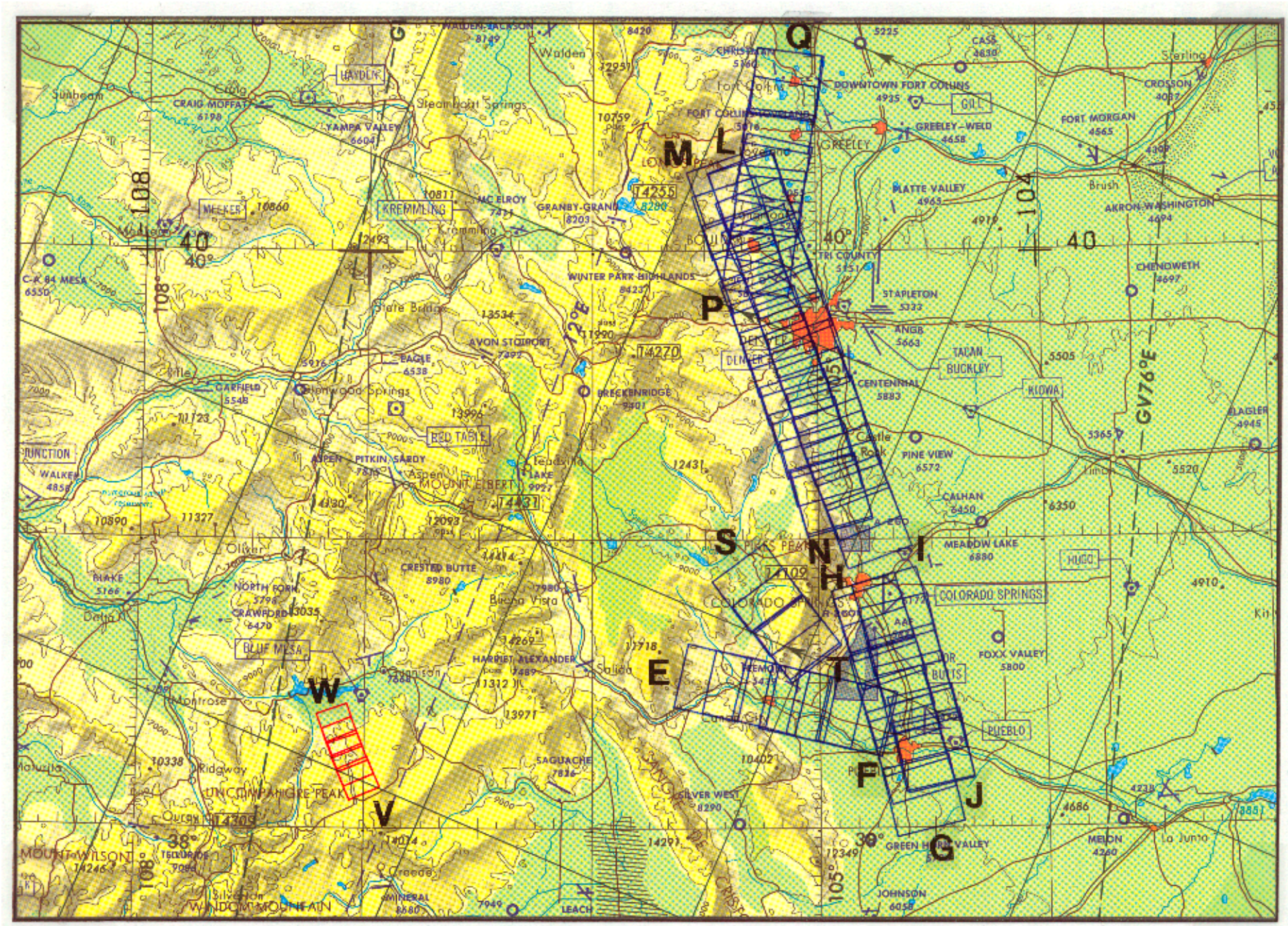

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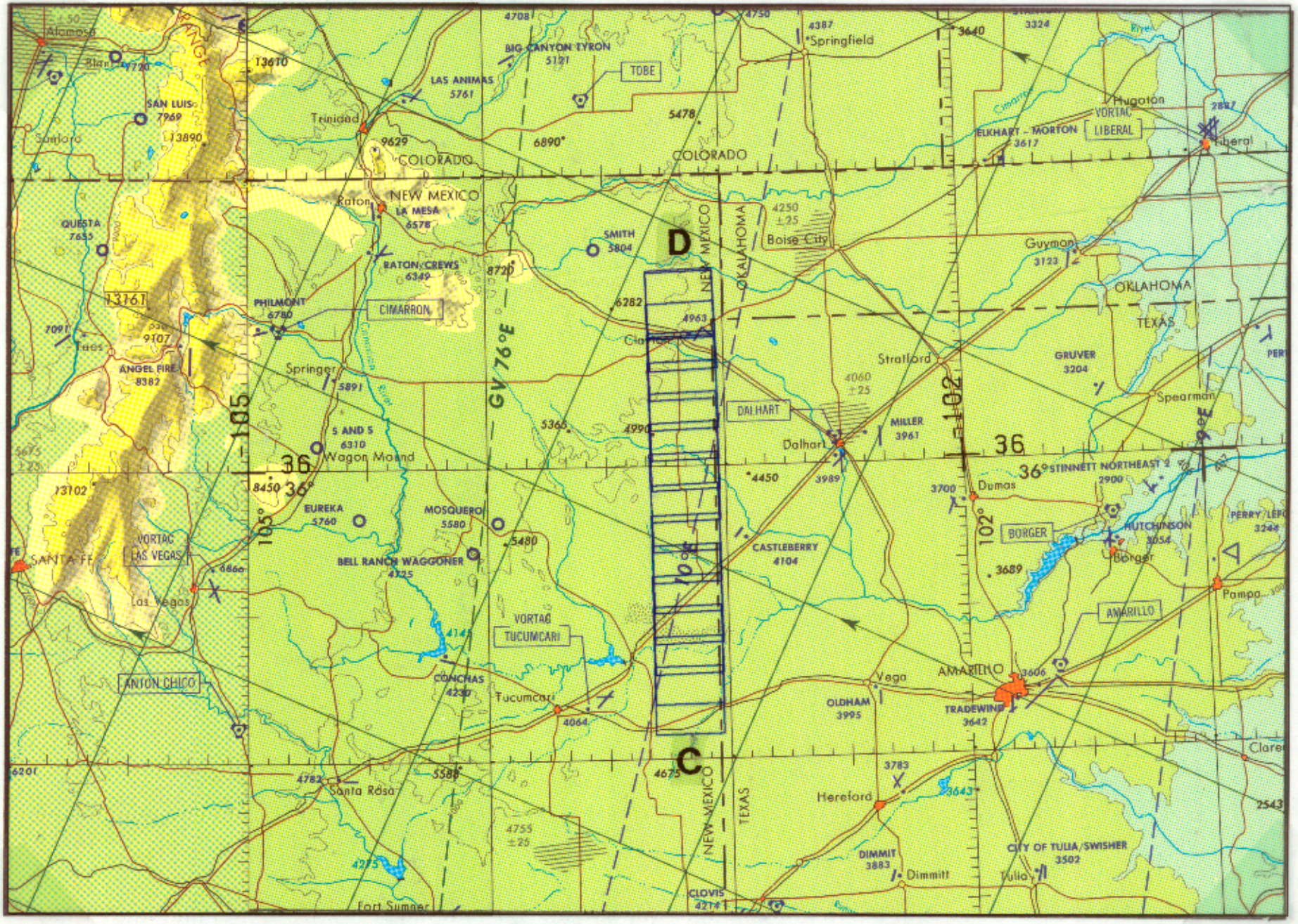
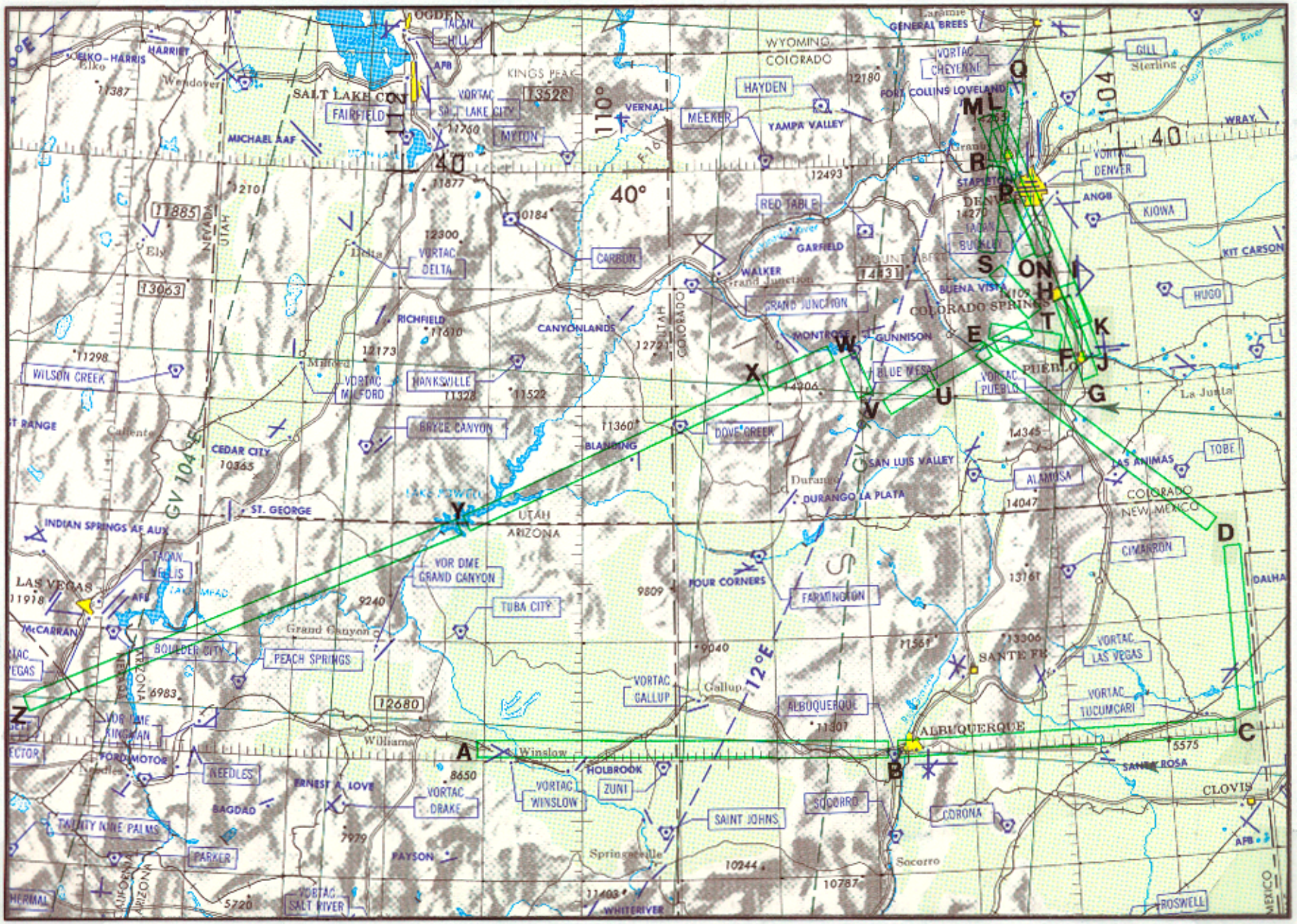


FLIGHT 99-140 30 SEPTEMBER 1999 A/C 806 RC-10 JNC 44



FLIGHT 99-140 30 SEPTEMBER 1999 A/C 806 TMS GNC 2